

# MANUALLY OPERATED PUMP INSERTER FOR TEST TUBES

## CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part application of allowed copending U.S. patent application Ser. No. 07/383,339, filed Jul. 24, 1989, to Tipton L. Golias et al., entitled "PUMP INSERTER FOR TEST TUBES", now U.S. Pat. No. 5,055,271, the disclosure of which is hereby incorporated by reference in its entirety. The present application includes subject matter in common with prior application Ser. No. 07/504,597, filed Apr. 4, 1990, which is a continuation-in-part of application Ser. No. 07/382,760, filed Jul. 21, 1989, which is a continuation-in-part of application Ser. No. 07/208,447 filed Jun. 20, 1988, abandoned, all of which are hereby incorporated by reference in their entireties.

## BACKGROUND OF THE INVENTION

The present invention relates to test tubes in general, and more particularly, to a manually operated apparatus for inserting pump mechanisms into test tubes which are sealed by a closure such that the contents of the test tube may be discharged without removing the closure from the test tube.

Heretofore it has been known to provide a resilient closure or rubber stopper for a container and to discharge the contents of the container by using a pump mechanism which establishes inlet and outlet flow paths through the closure. Air pressure through the inlet path pressurizes the interior of the container and causes the contents to flow through the outlet path. Pump mechanisms of this type are, of course, known and, prior to the present invention, the establishing of the fluid flow paths was accomplished by puncturing the closure with a hand-held pump mechanism.

There are, of course, numerous concerns when puncturing the closure of a test tube by hand. A fundamental problem, of course, is that a test tube is formed of glass and, therefore, is subjected to breaking if excessive forces are used.

Equally important is the need to align the direction of force relative to the elongated axis of the test tube to provide proper positioning of the pump mechanism. Furthermore, the amount of force necessary to penetrate or puncture the test tube closure is minimized if the direction of the inserting force is parallel to the longitudinal axis of the test tube rather than at some angle to the longitudinal axis of the test tube.

Yet another problem in connection with attaching pump mechanisms to test tubes by hand is the difficulty in handling such mechanisms because of their relatively small size.

A still further problem is the amount of time and labor involved in attaching pump mechanisms to test tubes if each pump must be attached by hand in sequence, on an individual basis, rather than attaching a plurality of pump mechanisms simultaneously to individual test tubes.

Avoiding contact with the specimen in the tube may also be an important consideration. Insertion of the pump mechanisms by hand may pose a risk of such undesirable contact occurring if test tube breakage should occur.

In allowed copending U.S. patent application Ser. No. 07/383,339, a pump inserter is disclosed for the

efficient automatic insertion of a large number of pump mechanisms into test tubes. However, in some circumstances, the use of such an apparatus may not be most efficient or cost effective, such as when only one or a small number of test tubes are involved.

Thus, the inventors recognized that there existed a need for a relatively inexpensive manually operated pump inserter for test tubes.

## SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a manually operated apparatus and method for attaching pump mechanisms to sealed test tubes in an efficient, cost effective manner.

The present invention overcomes the shortcomings and fills the need recognized by the inventors, by providing a manually operated mechanical apparatus and method for inserting one or more pump mechanisms, or parts of pump mechanisms, through test tube closures in a manner that reduces the chance of specimen contact.

The present invention therefore facilitates aseptic handling of samples when protection from sample contact is a concern.

The present invention contemplates insertion of a plurality of pump mechanisms, or parts thereof, simultaneously through the respective closures of a plurality of sealed test tubes.

The present invention also contemplates protecting the individual test tubes from breakage and aligning the test tubes and the pump mechanisms relative to each other such that the force applied to insert the pump mechanism through the test tube closure is aligned along the longitudinal axis of the test tube, thereby minimizing the amount of force necessary to penetrate the closure and reducing breakage and damage.

The present invention further contemplates a manually operated mechanical apparatus whereby one or more pump mechanisms are placed in a holder and retained in a desired position relative to the test tubes and one or more test tubes may be positioned accurately such that the pump mechanisms may be inserted through the closures of the desired test tubes by the actuation of a handle.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing benefits and advantages of the present invention will be more fully understood upon reading the following detailed description of the invention taken in conjunction with the drawings.

In the drawings, wherein like reference numerals identify corresponding components:

FIG. 1 is a side view, partially broken away, of an apparatus according to the principles of the present invention with pump mechanisms and test tubes illustrated; and

FIG. 2 is an exploded perspective view, illustrating the apparatus of the present invention from the opposite direction relative to FIG. 1.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the invention is now described with respect to the illustrated embodiment, it should be understood that the scope of the invention is not intended to be limited to the details of this embodiment.

Referring to FIG. 1, shown is a side view of an embodiment of the invention having a support frame 10